PHOSGENE

Phosgene is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 75-44-5 $COCl_2$

Molecular Formula: CCl_2O

Phosgene is a toxic, colorless, gas or volatile liquid with a suffocating odor that is similar to decaying fruit or moldy hay. It is slightly soluble in water and freely soluble in benzene, toluene, glacial acetic acid, chloroform and most liquid hydrocarbons (Merck, 1989). Phosgene is noncombustible and when wetted is corrosive and under danger from pressure buildup. Because the density of phosgene is more than three times that of air, concentrated emission plumes tend to settle to the ground and collect in low areas (CHIP, 1980).

Physical Properties of Phosgene

Synonyms: carbon oxychloride; carbonyl chloride; carbonic acid dichloride, combat gas

Molecular Weight:	98.91
Boiling Point:	8.3 ^oC
Melting Point:	-118 ^oC
Liquifies:	8 ^oC
Vapor Density:	3.4 (air = 1)
Vapor Pressure:	1180 mm at 20 ^oC (water = 1)
Density/Specific Gravity:	1.37 at 20/4 ^oC
Conversion Factor:	1 ppm = 4.05 mg/m^3

(Merck, 1989; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Phosgene is used for organic synthesis of isocyanates, polyurethane and polycarbonate resins, carbamates, organic carbonates and chloroformates, pesticides, and herbicides. It is also used in the manufacture of dyes, pharmaceuticals, and in metallurgy (Sax, 1987; U.S. EPA, 1994a).

The primary stationary sources that have reported emissions of phosgene in California are manufacturers of aircraft and parts (ARB, 1997b).

B. Emissions

The total emissions of phosgene from stationary sources in California are estimated to be at least 1 pound per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

No information about the natural occurrence of phosgene was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of phosgene.

However, the United States Environmental Protection Agency (U.S. EPA) has compiled ambient air data for phosgene from several locations in the United States from 1976-78 and in 1983. Results indicate mean concentrations of 0.08 and 0.45 micrograms per cubic meter ($\mu g/m^3$) or 0.02 to 0.11 parts per billion (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of phosgene was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Phosgene exists in the atmosphere in the gas phase. In the troposphere, reaction with the hydroxyl (OH) radicals are not important. Phosgene will be incorporated into rain, cloud, and fog water and undergo hydrolysis in aqueous solution to form carbon dioxide plus hydrochloric acid. The half-life and lifetime of phosgene in the troposphere are estimated to be a few weeks or less (WMOGRMP, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics "Hot Spots" Program (AB 2588). Of the risk assessments reviewed as of December 1996, for non-cancer health effects, phosgene did not contribute to a total hazard index in any of the risk assessments reporting a total chronic or acute hazard index greater than 1 (OEHHA, 1996b).

HEALTH EFFECTS

Probable routes of human exposure to phosgene are inhalation and dermal contact.

Non-Cancer: Phosgene is extremely irritating to the lungs, causing severe respiratory effects, including pulmonary edema. Symptoms of acute exposure include choking, chest constriction, coughing, painful breathing, and bloody sputum. Acute phosgene poisoning may affect the heart, brain, and blood (U.S. EPA, 1994a). Symptoms may be delayed up to 24 hours after exposure. Chronic inhalation exposure has been shown to result in some tolerance to acute effects noted in humans, but irreversible emphysema and pulmonary fibrosis may occur.

An acute non-cancer Reference Exposure Level (REL) of 12 $\mu g/m^3$ is listed for phosgene in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program, Revised 1992 Risk Assessment Guidelines. The toxicological endpoint considered for acute toxicity is respiratory irritation (CAPCOA, 1993). The U.S. EPA has not established a Reference Concentration (RfC) or an oral Reference Dose (RfD) for phosgene (U.S. EPA, 1994a).

No information is available on developmental or reproductive effects in humans or animals (U.S. EPA, 1994a).

Cancer: Limited human studies indicate no increase in the incidence of cancer among workers chronically exposed to phosgene. No adequate data exist on the carcinogenic effects of phosgene. The U.S. EPA has classified phosgene as Group D: Not classifiable as to human carcinogenicity, based on lack of animal and human data (U.S. EPA, 1994a). The International Agency for Research on Cancer has not classified phosgene for potential carcinogenicity (IARC, 1987a).